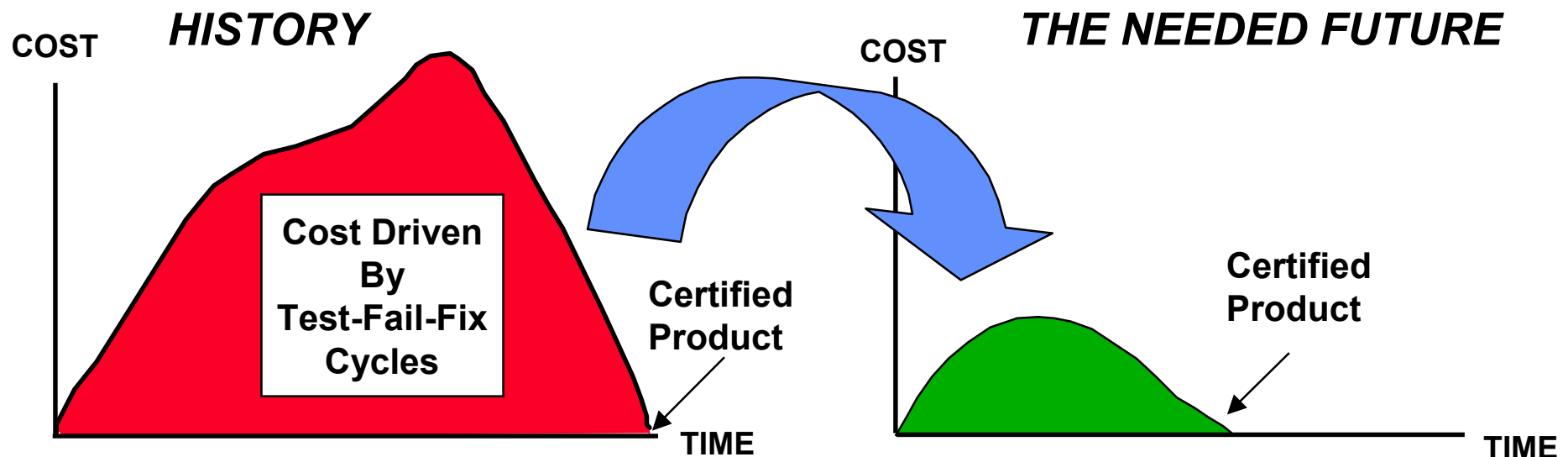


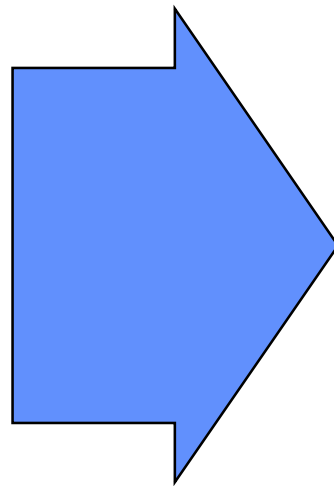
Robust Design Computational System (RDCS)

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Structures Technology

The Business Case for RDCS: Facilitate Low Cost Development



**“Robust Design
Computational
System”**

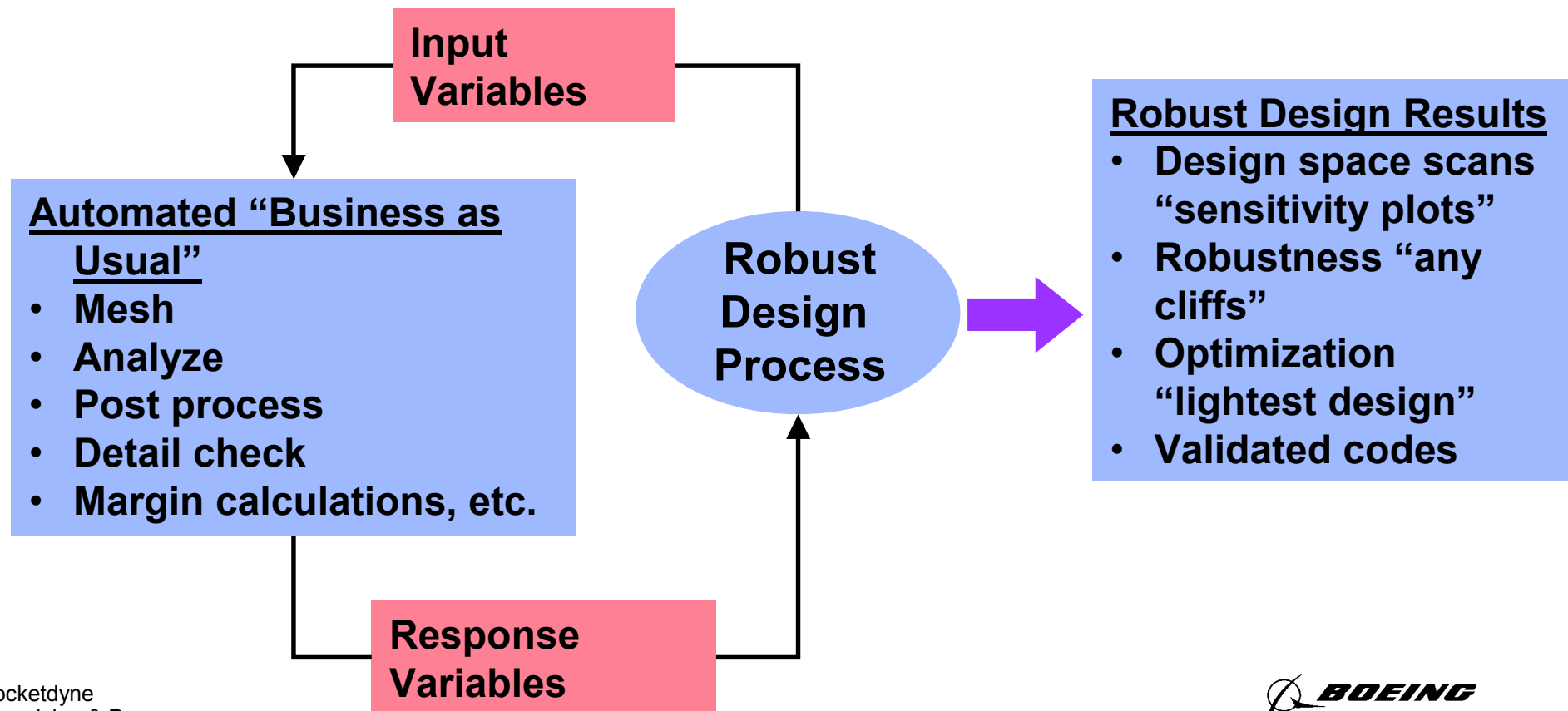


Capability Provided To:

- Fully Explore The Design Space
- Account For Variabilities
- Quantify Risks, Sensitivities
Margins, Reliabilities

Detailed Design Robust Design Process

Goal: Develop products insensitive to variation with an order of magnitude reduction in product development cost and cycle time.

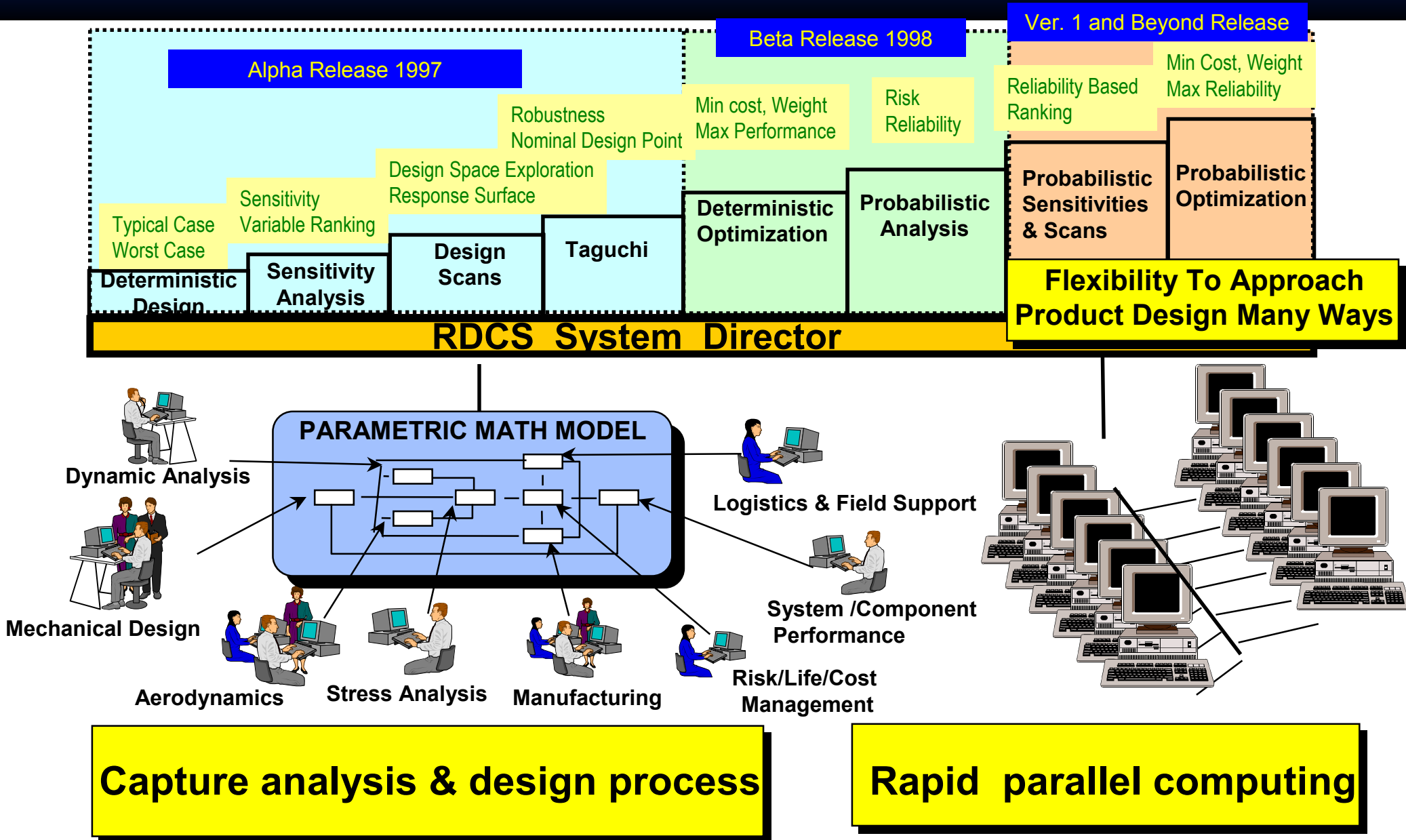


What is RDCS?

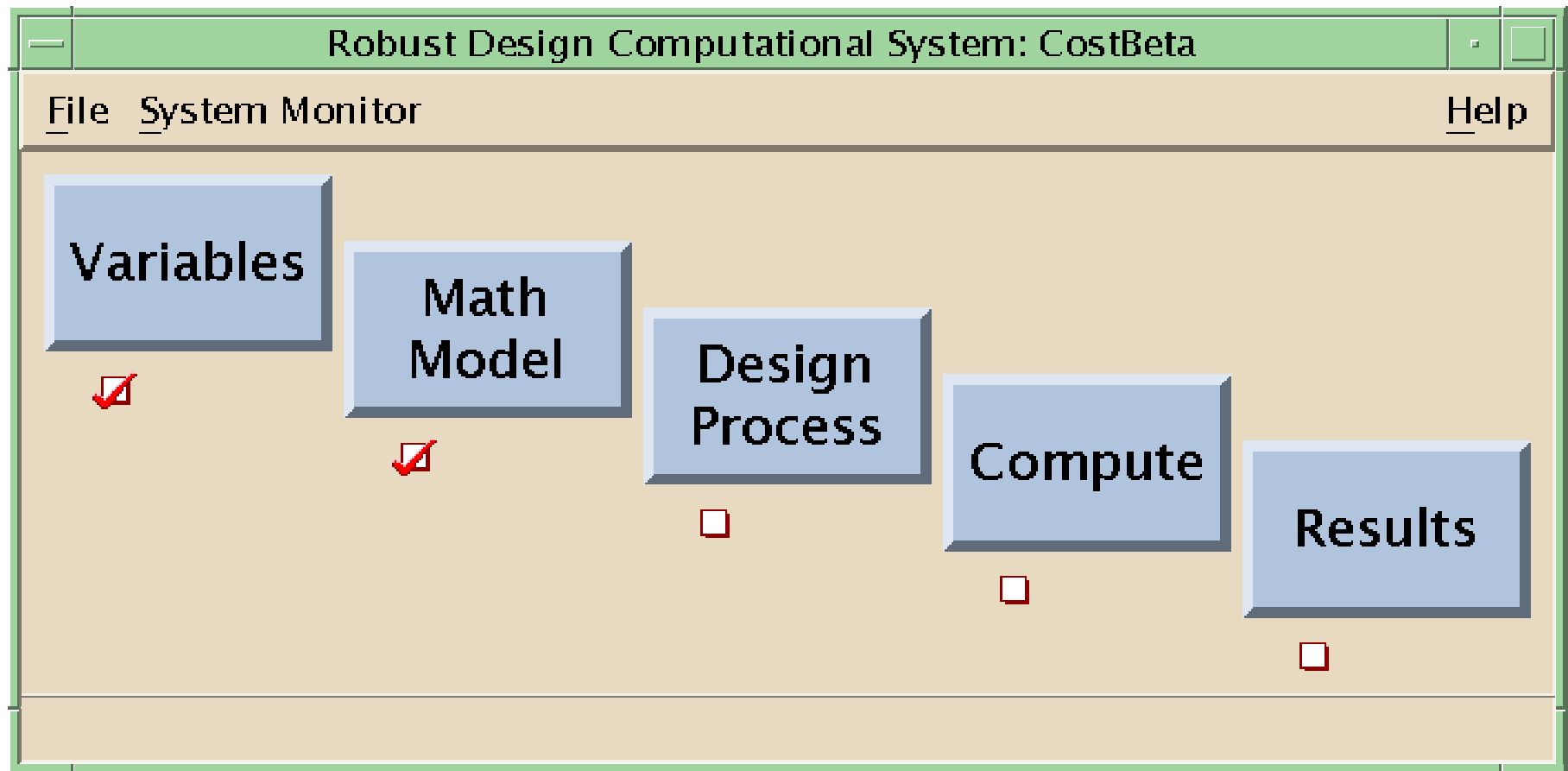
An Enterprise Wide Computational Tool

- **An engineering code with built in strategies to perform standard deterministic design and advanced robust design methods such as: sensitivity quantification, design scanning, Taguchi signal-to-noise, deterministic optimization and probabilistic risk assessment**
- **A framework for performing automated design explorations using multi-disciplinary systems models distributed over a unix computing network**
- **Not just an analysis program such as finite element or discipline specific stress / thermal / fluid analysis**
- **A computational system that takes care of the mundane tasks of: setting up multi-disciplinary parametric analyses, running them on a network of computers, plotting the results, etc.**

Robust Design Computational System



RDCS Workflow



Definition of Global Variables & Responses

- No Repetitive or Redundant Global Variable or Response Inputs
- Same Variables & Responses are Shared by All the Design Processes

The image shows two overlapping dialog boxes from a software application. The main dialog, titled "Input Variables: demo", has a "Variable Name" field containing "th2" and a "Description" field containing "Thickness of the insulation". Under "Variable Type", the "Continuous" radio button is selected. The "Viable Physical Range" section has four options: "–Inf to Inf", "0 to Inf" (selected), "–Inf to 0", and "other:". To the right of these options are two buttons: "Probabilistic Description ..." and "Deterministic Description ...". A list of variable names is shown on the right side of the main dialog, including Ri, h, k1, k2, th1, and th2. The "Deterministic Description" sub-dialog is open, showing the "Variable Name" as "th2 (continuous)". It has fields for "Source ID", "Description", "Lower Bound" (0.002), "Nominal Value" (0.025), and "Upper Bound" (0.05). Both dialogs have "Save", "Delete", "Clear", and "Close" buttons at the bottom.

Input Variables: demo

Variable Name: th2

Description: Thickness of the insulation

Variable Type: ☒ Continuous ☐ Discrete ☐ Enumerated

Viable Physical Range:

☐ –Inf to Inf

☒ 0 to Inf

☐ –Inf to 0

☐ other: [] []

Probabilistic Description ...

Deterministic Description ...

Variable Names:

Ri

h

k1

k2

th1

th2

Deterministic Description

Variable Name: th2 (continuous)

Source ID: []

Description: []

Lower Bound: 0.002

Nominal Value: 0.025

Upper Bound: 0.05

Ok Cancel Help

Save Delete Clear Close

RDCS Allows Global Variables with Probabilistic Description

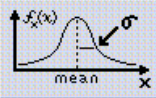
- Numerous Probabilistic Distribution Models Such As Normal, LogNormal, Weibull etc. are available for Characterizing The Variations

Probabilistic Description

Variable Name: hours_flowm (continuous)

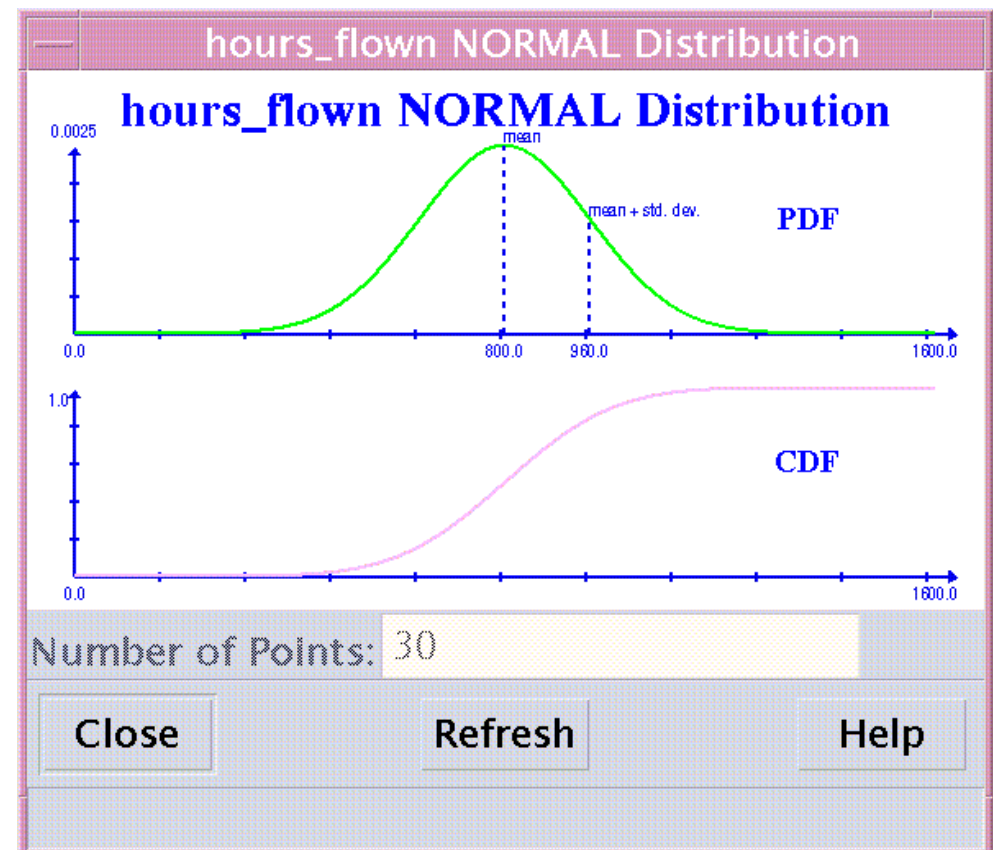
Source ID:

Description:

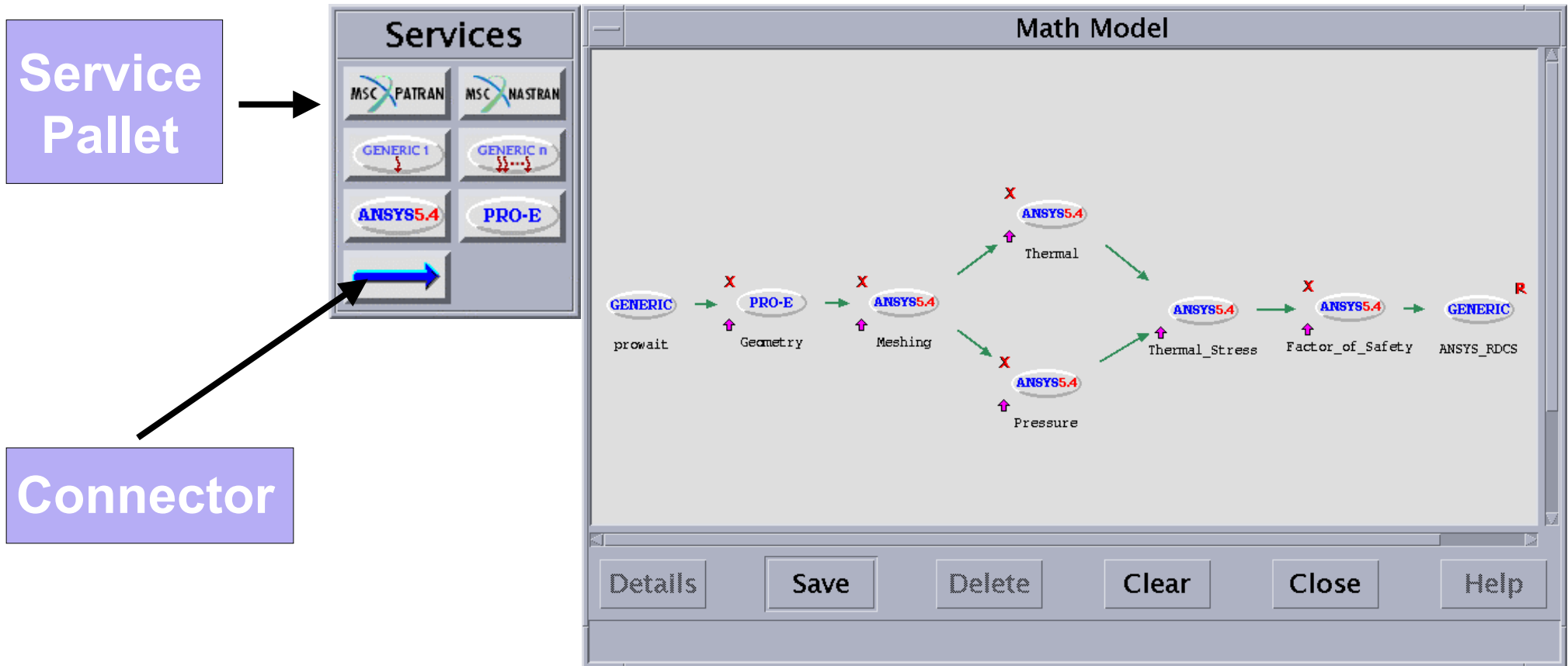
NORMAL 

m_mean

m_stddev

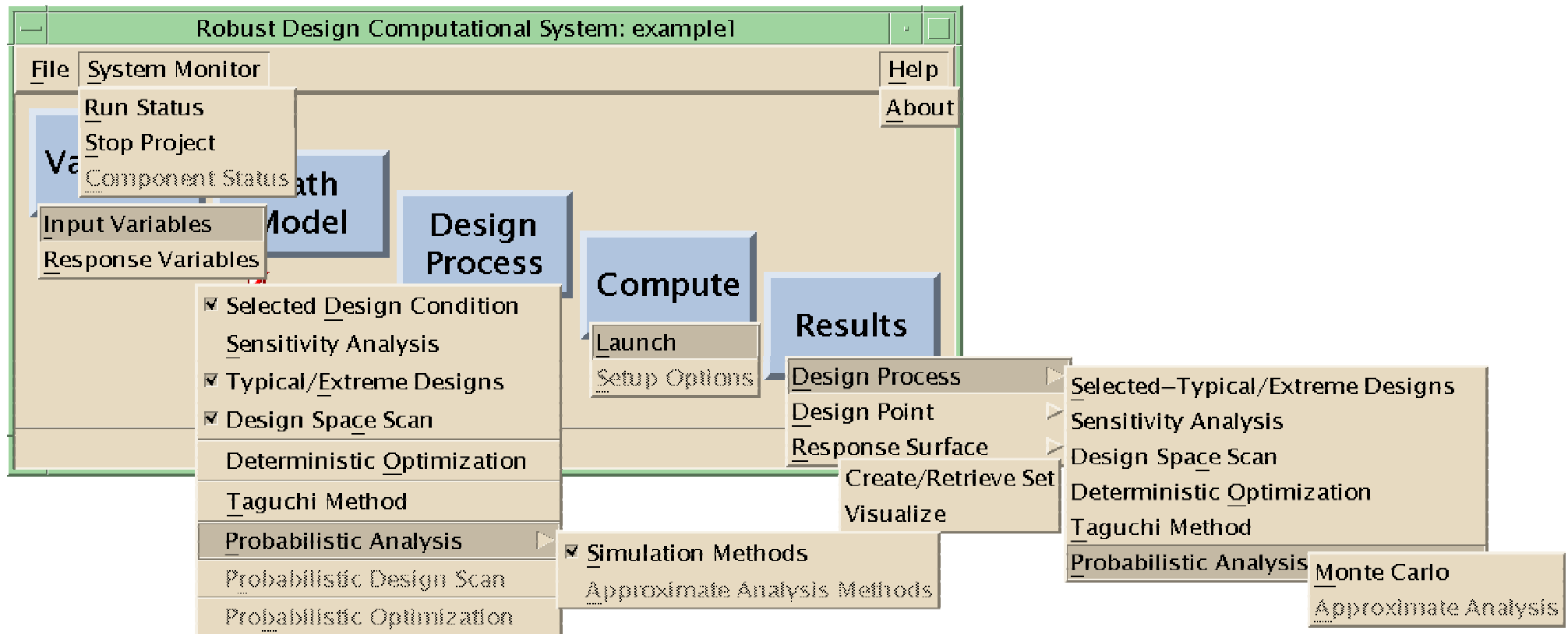


Graphical Definition of Multi-disciplinary Math Model

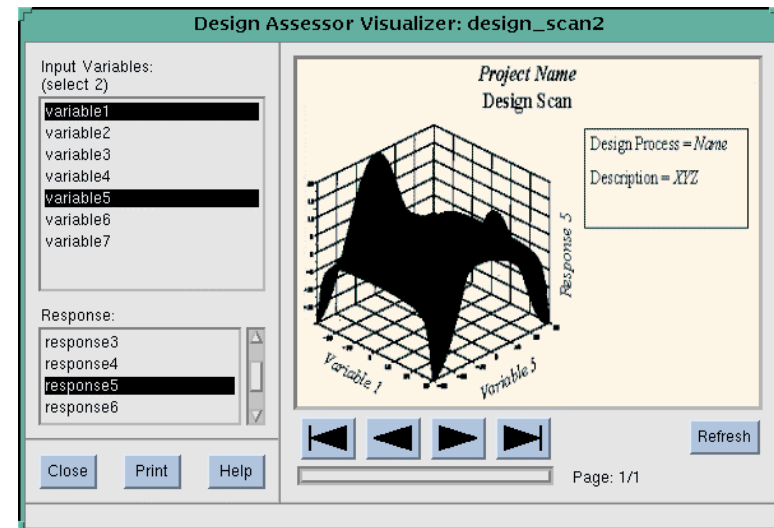
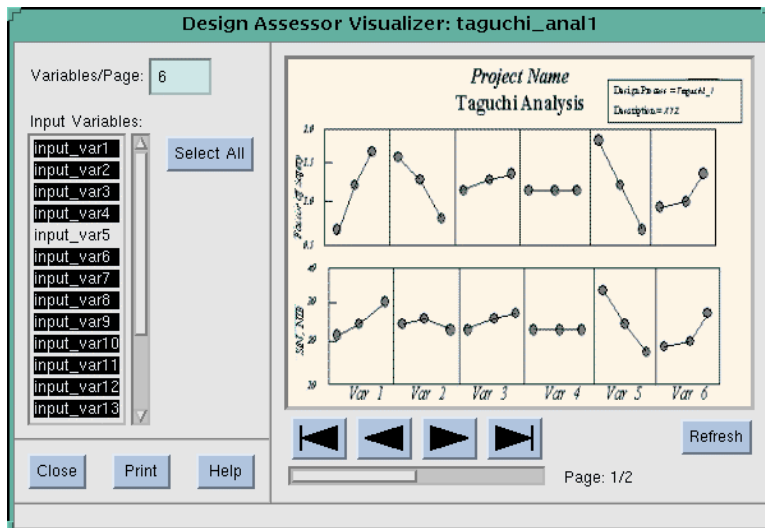
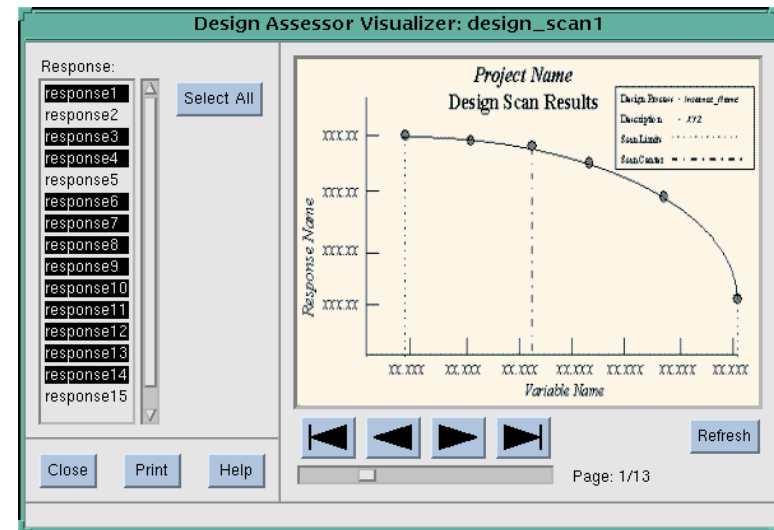
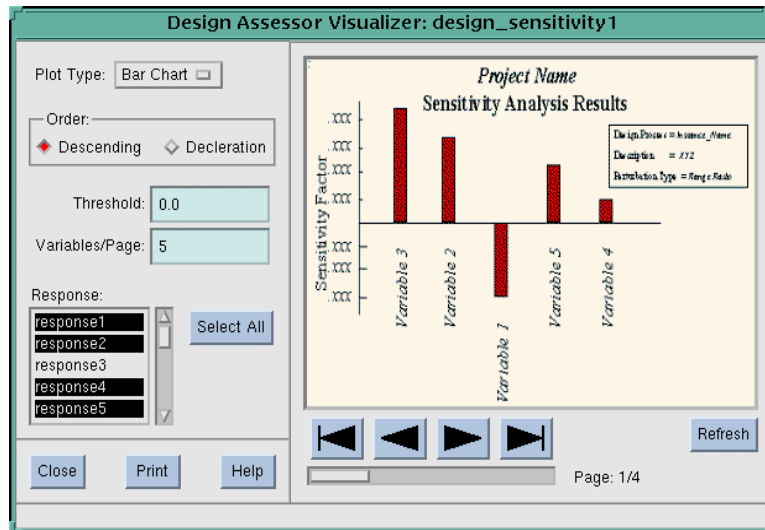


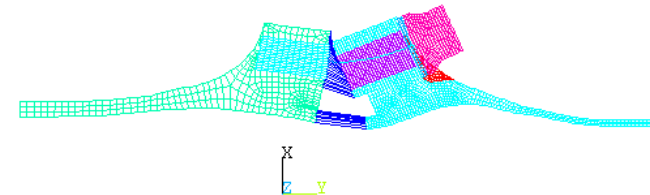
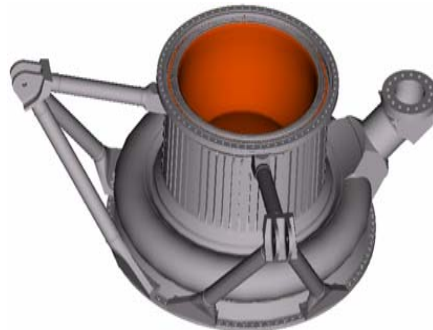
- Customizable Service Pallet: Click and Drop Services

Design Process Selection



RDCS Design Visualization & Assessment





Software Architecture of RDCS

State Of The Art

- **Graphical User Interface**
 - **Ease of Use**
 - **Minimal Training**
- **Client / Server**
 - **Distributed Computing**
 - **Major Cycle Time Improvement**
 - **Model for Internet/Intranet Operation**
- **Open Architecture**
 - **Adding New Design Processes**
 - **Permits Rapid Links To Other Codes**
- **Object Oriented Design**
 - **Ease of Maintenance**
 - **Reusability**
 - **Ease of Enhancement**
- **C++ Motif**
 - **Industry Standard**
 - **Supports Object Oriented Design**